



## PATENTS

## THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of : Jorge A. Morando  
For : **MATERIAL FORMULATION FOR  
GALVANIZING EQUIPMENT SUBMERGED IN  
MOLTEN ALUMINUM AND ALUMINUM/ZINC  
MELTS**  
Serial No. : 08/909,117  
Filed : August 11, 1997  
Last Office Action : October 21, 1998  
Examiner : Deborah Yee  
Attorney Docket No. : JAM 2 005-1 (MJV 106BCON)

Cleveland, Ohio 44114-2518  
September 7, 1999

**DECLARATION UNDER 37 CFR § 1.132**

Asst. Commissioner for Patents  
Washington, DC 20231

Dear Sir:

I, Jorge A. Morando, hereby declare that:

1. I received a Bachelors Degree in Engineering from in the University of Buenos Aires in 1956.
2. I received a Masters Degree in Mechanical Engineering from the University of Buenos Aires in 1958.
3. From 1969 to 1982, I was Director of Aerospace Products for Fairchild Aerospace.
4. From 1982 to 198<sup>5</sup>~~7~~ I was Technical and Marketing Vice President for MCCM Technology.
5. Since 1985, I have held the position of President, first with Plasma Fusion and then with Alphatech.

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6. I have been a named inventor in over one dozen U.S. Patents, many in the area of material science.
7. I am the inventor of the subject matter described in United States Application Serial No. 08/958,614 ("The Morando Application").
8. I have read and understood United States Patent No. 4,034,589.
9. I have observed that U.S. Patent No. 4,034,588 teaches an alloy having a nickel content ranging from 2% to 20%, with examples ranging from 2.4 to 10.2%. Through experiments performed under my direction and control, I believe that greater than 10 percent Ni is an important requirement of the invention set forth in The Morando Application to achieve improved toughness and corrosion/oxidation resistance in an alloy used in molten zinc and aluminum environments. Furthermore, greater than 10% Ni is important to achieve an asymptotic Ks stability.
10. I have observed that U.S. Patent No. 4,034,588 teaches a cobalt range of from 5% to 65% and all pertinent examples require at least 48%. Through experiments performed under my direction and control, I can conclude that less than 15% cobalt by weight is an advantageous requirement of The Morando Application because of the cost associated with cobalt and a finding that about 15% cobalt provides a solution matrix containing sufficient carbide forming elements to reduce solubility and improve high temperature strength of the alloy in molten zinc and aluminum environments.
11. I have observed that U.S. patent 4,034,586 does not have any specific teaching concerning the relative proportions of chromium, tungsten, molybdenum, vanadium and niobium. It is my understanding and belief, as a result of experiments performed under my direction and control and years of experience working with

molten metal resistant alloys, that a combined content of 27% and 65% chromium, tungsten, molybdenum, vanadium and niobium in combination with carbon is critical to provide a material having a microstructure rich in MC type carbides and having a tough matrix structure with high temperature strength, resistance to annealing, and low solubility in zinc. To provide this form the of matrix structure, the alloying elements, particularly those forming carbides, must remain in a suitable high quantity in the solid super saturated solution during cooling after solidification. This can only be achieved through proper element quantities in the composition. More specifically, it is necessary for the present invention to provide a necessary minimum quantity of carbide/boride forming elements to achieve sufficient strength but it is also necessary to limit the quantity of these elements to avoid the undesirable formulations of carbides in the form of M<sub>2</sub>C and M<sub>6</sub>C which become sites for initiation and propagation of thermal cracks, reducing the thermal shock resistance of the alloy. U.S. Patent 4,034,580 fails to teach or suggest the necessary combination of carbide forming elements as claimed in the present invention and fails to suggest the necessary quantity of carbon and boron to form the desired compounds.

12. Based on the opinions set forth above, I can conclude that an alloy of the type exemplified in U.S. Patent 4,034,580 would not function satisfactorily in a molten aluminum or zinc environment and would be inferior to the alloy encompassed by The Morando Application. Furthermore, I can conclude that the alloy disclosed in U.S. Patent 4,034,583 functions adequately as a piercing metal, largely because of its very high cobalt content. Moreover, cobalt provides excellent high temperature tensile strength, creep strength and oxidation resistance, but is

extremely expensive. The present inventive alloy composition is an advancement in the art because it achieves superior properties in a molten metal environment without the use of high cobalt levels.

13. I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true and further that these statements have been made with knowledge that willful, false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of United States Code, and that such willful, false statements may jeopardize the validity of the application or any patent issuing thereon.

SEP 10/1999  
Date

Jorge A. Morando  
Jorge A. Morando